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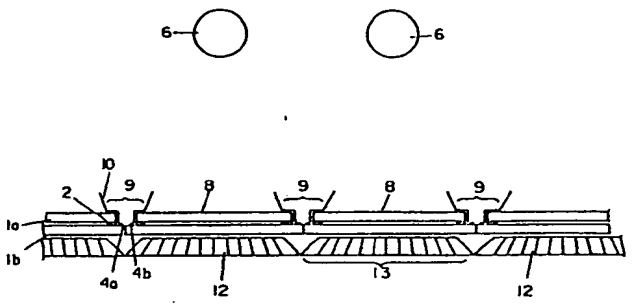
(54) LARGE LIQUID CRYSTAL DISPLAY.

(57) A large liquid crystal display in which many liquid crystal display elements (8) are arranged on a plane, each liquid crystal display element (8) having a liquid crystal (3) placed between transparent substrates that transmit the light emitted from sources (6) of light. The display portion of each liquid crystal display element (8) is covered with a light guide (13) which consists of one or more light guide elements (12) and which guides the rays. Seams (9) among the liquid crystal display elements (8) are also covered by the light guides (13). Namely, the screen is constituted by the light guides (13) that also cover seams (9) among the plurality of liquid crystal display elements (8). Therefore, lattice-like lines do not appear, and the brightness can be made nearly uniform on the whole screen of a large liquid crystal display, enabling a high-quality image to be formed on the whole screen.



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SPECIFICATION

TECHNICAL FIELD

This invention relates to large-sized liquid crystal display which is used as a large picture display for a sign or advertisement at railway stations, airports or for projection at halls or theaters.

TECHNICAL BACKGROUND

Liquid crystal displays have been widely used as watches, electronic calculators or the like because display can be done with low power consumption. Recently, large-sized liquid crystal display has been developed which comprises a large number of display elements arranged. This is because it is required to meet public and social needs of providing information to a large number of persons at once.

The structure of a liquid crystal display element constituting such a large-sized liquid crystal display will be described with reference to Fig. 1.

In the liquid crystal display element, sealing resin 2 is positioned around glass plates 1a and 1b to form a given gap so that liquid crystal 3 is enclosed therein. On the two glass plates 1a and 1b are formed transparent electrode leader portions 4a and 4b, and theses electrode

leader portions 4a and 4b are connected to a drive circuit (not shown). To both outer sides of the glass plates 1a and 1b are attached polarizing plates 5a and 5b, with which the liquid crystal display element is formed. At a light source 6 side of the polarizing plate 5b of the liquid crystal display element is attached a diffusing plate 7.

A large-sized liquid crystal display is formed with a plurality of the above-mentioned liquid crystal display elements being arranged on a plane to form a large-sized screen. Fig. 2 shows a large-sized liquid crystal display contructed in this way, in which display a large number of liquid crystal display elements 8 having the above-mentioned structure are arranged. In Fig. 2, the reference 9 is a junction between adjacent liquid crystal display elements 8, and the reference 10 is a lead wire for connecting the above-mentioned electrode leader portions 4a and 4b to the drive circuit. The side of the electrode leader portion 4a is also drawn to the side of the electrode leader portion 4b to be connected.

However, in such conventional large-sized liquid crystal display, the sealing resin 2 and the electrode leader portions 4a and 4b positioned at the junction 9 are recognized from the front (opposite to the light source 6), and therefore, it forms a frame of the liquid crystal display element 8 resulting in the fact that lattice-like

lines where no display is shown are seen in the large-sized liquid crystal display. For this reason, the picture on the entire screen is difficult to be seen, and this has been the largest obstacle to the popularization of large-sized liquid crystal display.

DISCLOSURE OF THE INVENTION

The present invention contemplates to resolve such conventional problems, and to provide a large-sized liquid crystal display with which non-diplay line caused from the sealing resin and the electrode leader portions positioned at the junctions between a plurality of liquid crystal display elements is recognized thereby the brightness is substantially uniform throughout all over the screen.

To achieve this object, in the present invention a large number of liquid crystal display elements each formed such that liquid crystal is arranged between transparent substrates through which light from a light source passes, are arranged on a single plane, and display portions of the respective liquid crystal display elements is covered by a plurality of light guides each formed of a plurality of light guide elements which are provided such that one or more of them are provided for each of the liquid crystal display elements, and also junctions between the above-mentioned respective liquid crystal display elements are covered by the same. According to this structure, the

screen is formed by the light guide so that the junctions of a plurality of liquid crystal display elements are also covered, and thus non-display line of lattice fashion does not appear, equalizing the brighness throughout all over the screen in sence of sight, and bettering the entire picture.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram showing the structure of a general liquid crystal display element; Fig. 2 is a schematic diagram of a conventional large-sized display; Fig. 3 is schematic diagram showing an embodiment of the large-sized liquid crystal display according to the present invention; Fig. 4 is a schematic diagram showing an enlarged view of an important portion of the same; Fig. 5 is an enlarged perspective view of a light guide forming a display according to the present invention; Figs. 6 and 7 are structural diagrams of the light guide formed of diffusing reflecting surface and a mirror surface for the description of the present invention; Fig. 8 is a perspective view showing one of units forming the large-sized liquid crystal display according to the present invention; Fig. 9 is a perspective view showing a state where the units are combined to form a large-sized liquid crystal display; and Figs. 10, 11 and 12 are schematic diagrams showing another embodiment of the present invention respectively.

BEST MODE FOR PRACTICING THE INVENTION

The present invention will be described hereinbelow with reference to drawings. Elements of the embodiments of the present invention which are the same as those in the conventional examples are denoted by the same references, and the description thereof is omitted.

Figs. 3 through 5 show an embodiment of the present invention. First of all, a large number of liquid crystal display elements 8 of the above-mentioned structure are arranged on a single plane, and a plurality of light sources 6 are arranged at the rear side thereof. The referenc 9 indicates junctions between adjancent liquid crystal display elements 8, and the reference 10 indicates lead wires for connecting the above-mentioned electrode leader portions 4a and 4b to the drive circuit. The electrode leader portion 4a side is also drawn to the electrode leader portion 4b side to be connected. In the present invention, however, a plurality of light guide elements 12 are provided where each light guide element 12 has a size corresponding to respective pixels 11 formed on transparent electrode within liquid crystal display element 8 so as to guide light rays from each pixel 11. The shape of the light guide 12 is such that the area of an end surface opposite to the end connected to the pixel 11 is larger than the area of the other end so as to enlarge a display area.

Furthermore, the light guide 13 corresponding to a single liquid crystal display element 8 is a set of a plurality of light guide elements 12 and is of honeycomb shape, and the sum of areas of end surfaces opposite to those connected to the respective pixels 11 is substantially equal to or comparable with an area corresponding to the sum of the liquid crystal display element 8 and one half the width of the junction 9. With such structure, therefore, the light guide elements 12 forming the honeycomb shaped light guide 13 necessarily exist above the junctions 9. The above-mentioned light guide element 12 has a structure, as shown in Fig. 5, such that on an inner wall of a hollow cylindrical member 15 made of a resin molding, such as acrylic resin, ABS (acrylonitrile butadiene styrene) resin or the like, or a metal molding, a mirror surface (total reflection surface) 16 made of a metal, such as aluminum whose reflection coefficient is high, is provided. It is practical that the mirror surface 16 is formed by way of aluminum vapor deposition in view of reflection coefficient and the number of manufacturing processes. The light guide element 12 may be formed by providing a mirror surface (total reflection surface), whose reflection coefficient is high, on an outer surface of a member having a high transmittance.

The reason that the light guide 12 element requires the mirror surface 16 is, as seen from the comparison

between Figs. 6 and 7, that with a diffusion reflection surface 17 as shown in Fig. 6 the light ray "A" electrically transmitted through the liquid crystal display element 8 is diffused and reflected at the diffusion reflection surface 17, and especially components "B" directed toward the light source 6 among the reflected components repeat reflection between the diffusion reflection surface 17 and the glass plate 1b, resulting in the decrease in light amount. Therefore, the amount of light outputted from the display portion drops largely. On the other hand, in the case of the mirror surface 16 of Fig. 7 showing an embodiment of the present invention, the incident angle is equal to reflection angle while it is constructed of a member having a high reflection coefficient, and thus the number of reflections is minimum, extremely reducing the drop of light amount. Namely, because of the necessity of guiding the light rays emitted from the respective pixels 11 with minimum dropping of light amount, the light guide element 12 must have a mirror surface 16.

When considering the light guide elements 12 forming the above-mentioned honeycomb shaped light guide 13 as having a structure that a mirror surface 16 is provided by aluminum vapor deposition on the inner surface of a hollow cylindrical solic body 15 made of ABS resin for instance,

the reflection of approximately 83 to 85 % is obtained. To this end it is necessary for peripheral light guide elements 12 that the inclination angle θ shown in Fig. 4 is set to approximately 10 degrees (in the case of using guest-host type liquid crystal as the liquid crystal 3). Although it is unpreferable to set this angle θ to approximately 10 degrees in view of the fact that the weight of the light guide element 12 can be reduced by shortening the same with the inclination angle θ being set to a large value close to 90 degrees, such very large angle θ (more than 20 degrees according to experiments) causes the occurrence of dropping in brightness due to the increase in the number of times of reflections of light rays at the reflection surface (mirror surface 16), generaing inequality in brightness. For this reason 10 degrees is adopted. This inclination angle θ becomes smaller and smaller to be close to 0 as approaching the center of the panel because it is necessary that the area of a displaying portion of the light guide elements 12 are equal to each other.

As the liquid crystal 3 arranged in the above-mentioned liquid crystal display element 8 may be used twist-nematic (TN) type liquid crystal, guest-host (G-H) type liquid crystal, and other type liquid crystal which are all known in the art. Generally, TN type liquid

crystal or G-H type liquid crystal is used, where each of them has advantages and disadvantages. The TN type liquid crystal is suitable for a displaying unit used for displaying characters mainly. Namely, this is because one using TN type liquid crystal does not require gradation and has an advantage that it exhibits relatively bright characteristic. However, on the contrary, while the visual angle varies depending on the structure of a panel, the angle (viewing angle) with which surface brightness is one half that at the front is 30 degrees or so, and there is a disadvantage that it is not suitable for a large-sized display formerd by arranging a large number of liquid crystal display elements on a single plane as in the present invention.

On the other hand, since the G-H type liquid crystal, which is disclosed in patent publication (Tokkoshou) 47-3778 or the like, has transmittance lower than that of TN type liquid crystal, it is not as good as the TN type in connection with the brightness of the screen, but has a visual angle which is approximately twice that of the TN type, and therefore, G-H type is advantageous for large-sized display. Furthermore, G-H type liquid crystal has an advantage that gradation control can be readily performed sicne transmittance curve is gentle which transmittance correponds to amount of light

transmitted through the panel with respect to applied voltage, and therefore, it is suitable for displaying images. The above-mentioned shortage in screen brightness can be compensated for by the power of light source.

Fig. 8 shows a state where a liquid crystal display element 8 is attached to a frame 18 and a light guide 13 is arranged at the front surface of the liquid crystal display element 8 to form a liquid crystal display unit 19. A plurality of the liquid crystal display units 19 are arranged in longitudinal direction and in trransverse direction as shown in Fig. 9 to be secured and a frame 20 is provided at the periphery thereof so as to form a large-sized liquid crystal display.

Fig. 10 shows an embodiment in which a diffusion plate 21 is connected to the front surface of the light guide 13. The diffusion plate 21 is made of acrylic resin or polycarbonate to have light diffusion characteristic, and is attached to the front surface of the light guide 13 by way of telescopically engagement between a recess and a projecting portion or by way of an adhesive. With this arrangement, by switching respective pixels of the liquid crystal display elements 8 the luminous flux emitted from the light source 6 positioned at the back side transmits through the liquid crystal display elements 8 to pass through the light guide 13, and the luminous flux passing

through the light guide 13 is diffused by the diffusing plate positioned at the front surface, and thus visual angle is widened. Color filters 22 are formed by printing color ink on the front surface of the diffusion plates 21 in correspondence with respective light guide elements 12 so as to reproduce colors R, G, B. Namely, the light passed through the light guide 13 is diffused by the diffusion plate 21 and is passed through the color filter 22 so as to select a desired color wavelength.

Although it has been described in the above-mentioned embodiment that the light guide element 12 has a size so that it covers the outer periphery of a singel pixel 11 within a liquid crystal display element 8, a plurality of pixels 11 may be covered by a single light guide element 12 by arranging the combination of R, G, B as a unit as shown in Fig. 11 depending on the arragement of pixels in the liquid crystal display element 8. Furthermore, a single liquid crystal display element 8 may be covered by a single light guide as shown in Fig. 12 depending on the number of pixels and the way of arrangement of pixels.

CAPABILITY OF INDUSTRIAL APPLCATION

The large-sized liquid crystal display according to the present invention is formed as described in the above, and since a light guide, which guides light rays from

respective pixels of a plurality of liquid crystal display elements, is provided at the front surfaces of the liquid crystal elements to be positioned above sealing resin portions and electrode leader portions which are positioned at juctions between a plurality of liquid crystal display elements, no lattice-like non-display line appears visually so that it is possible to provide a satisfactory picture throughout the entire screen. Moreover, since the light guide is formed of mirror surface (total reflection surface), only small light energy loss occurs, in contrast with the case of diffusion reflection surface. Therefore, the deterioration in brightness throughout the entire screen is substantially comparable with that of the screen using no light guide.

CLAIMS

1. A large-sized liquid crystal display formed by arranging a large number of liquid crystal display elements on a single plane, each of said liquid crystal display elements being formed by arranging liquid crystal between transparent substrates which allow light from a light source to pass through, characterized in that a plurality of light guides are provided such that one or more light guides are provided for one of said liquid crystal display elements to guide light rays, and in that display portions of said respective liquid crystal display elements are covered by said light guides and junctions between said liquid crystal display elements are also covered by said light guides.

2. A large-sized liquid crystal display as claimed in Claim 1, wherein said light guide comprises light guide elements whose number is equal to that of pixels of said liquid crystal display elements.

3. A large-sized liquid crystal display as claimed in Claim 1, wherein said light guide element is formed of a cylindrical solid body having a mirror surface showing high reflection coefficient at an inner surface thereof.

4. A large-sized liquid crystal display as claimed in Claim 1, wherein said light guide element is formed of a solid body showing a high transmittance and having a mirror surface of a high reflection coefficient at an outer surface thereof.

5. A large-sized liquid crystal display as claimed in Claim 1, wherein said light guide element is formed of a member having a mirror surface which is formed by aluminum vapor depositting on an inner surface of a cylindrical resin molding.

6. A large-sized liquid crystal display as claimed in Claim 1, wherein as said liquid crystal arranged in said liquid crystal display element is used guest-host type liquid crystal.

7. A large-sized liquid crystal display as claimed in Claim 2, wherein said light guide elements are provided with inclination with respect to a plane of transparent substrates forming said liquid crystal elements such that the inclination angle of said light guide elements is maximum at the periphery of the panel and becomes smaller and smaller as approaching the center of said panel.

8. A large-sized liquid crystal display formed by arranging a large number of liquid crystal display elements on a single plane, each of said liquid crystal display elements being formed by arranging liquid crystal between transparent substrates which allow light from a light source to pass through, characterized in that a plurality of light guides are provided such that one or more light guides are provided for one of said liquid crystal display elements to guide light rays, said light guide element being formed of a cylindrical member having a mirror surface of a high reflection coefficient at an inner surface thereof, and in that display portions of said respective liquid crystal display elements are covered by said light guides and junctions between said liquid crystal display elements are also covered by said light guides.

9. A large-sized liquid crystal display as claimed in Claim 8, wherein said light guide comprises light guide elements whose number is equal to that of pixels of said liquid crystal display elements.

10. A large-sized liquid crystal display as claimed in Claim 8, wherein said light guide element is formed of a member having a mirror surface which is formed by aluminum vapor depositting on an inner surface of a cylindrical resin molding.

11. A large-sized liquid crystal display as claimed in Claim 8, wherein as said liquid crystal arranged in said liquid crystal display element is used guest-host type liquid crystal.

12. A large-sized liquid crystal display as claimed in Claim 8, wherein said light guide elements are provided with inclination with respect to a plane of transparent substrates forming said liquid crystal elements such that the inclination angle of said light guide elements is maximum at the periphery of the panel and becomes smaller and smaller as approaching the center of said panel.

13. A large-sized liquid crystal display formed by arranging a large number of liquid crystal display elements on a single plane, each of said liquid crystal display elements being formed by arranging liquid crystal between transparent substrates which allow light from a light source to pass through, characterized in that a plurality of light guides are provided such that one or more light guides are provided for one of said liquid crystal display elements to guide light rays, said light guide element being formed of a member showing a high transmittance and having a mirror surface of a high reflection coefficient at an outer surface thereof, and in that display portions of

said respective liquid crystal display elements are covered by said light guides and junctions between said liquid crystal display elements are also covered by said light guides.

14. A large-sized liquid crystal display as claimed in Claim 13, wherein said light guide comprises light guide elements whose number is equal to that of pixels of said liquid crystal display elements.

15. A large-sized liquid crystal display as claimed in Claim 13, wherein said light guide element is formed of a member having a mirror surface which is formed by aluminum vapor depositting on an inner surface of a cylindrical resin molding.

16. A large-sized liquid crystal display as claimed in Claim 15, wherein as said liquid crystal arranged in said liquid crystal display element is used guest-host type liquid crystal.

17. A large-sized liquid crystal display as claimed in Claim 14, wherein said light guide elements are provided with inclination with respect to a plane of transparent substrates forming said liquid crystal elements such that

the inclination angle of said light guide elements is maximum at the periphery of the panel and becomes smaller and smaller as approaching the center of said panel.

18. A large-sized liquid crystal display formed by arranging a large number of liquid crystal display elements on a single plane, each of said liquid crystal display elements being formed by arranging liquid crystal between transparent substrates which allow light from a light source to pass through, characterized in that a plurality of light guides are provided, each of said light guides being cylindrical and formed such that a mirror surface of a high reflection coefficient is formed, the number of said light guides being equal to that of the pixels of said liquid crystal display elements, in that display portions of said respective liquid crystal display elements are covered by said light guides and junctions between said liquid crystal display elements are also covered by said light guide, and in that said light guide elements are provided with inclination with respect to a plane of glass plates forming said liquid crystal elements such that the inclination angle of said light guide elements is maximum at the periphery of the panel and becomes smaller and smaller as approaching the center of said panel.

19. A large-sized liquid crystal display as claimed in Claim 18, wherein as said liquid crystal arranged in said liquid crystal display element is used guest-host type liquid crystal.

20. A large-sized liquid crystal display formed by arranging a large number of liquid crystal display elements on a single plane, each of said liquid crystal display elements being formed by arranging liquid crystal between transparent substrates which allow light from a light source to pass through, characterized in that a plurality of light guides are provided to guide light rays, each of said light guides being formed such that a mirror surface is formed by alumunum vapor depositing on an inner surface of a cylindridal resin molding, the number of said light guides being equal to that of the pixels of said liquid crystal display elements, in that display portions of said respective liquid crystal display elements are covered by said light guides and junctions between said liquid crystal display elements are also covered by said light guide, and in that said light guide elements are provided with inclination with respect to a plane of glass plates forming said liquid crystal elements such that the inclination angle of said light guide elements is maximum at the periphery of the panel and becomes smaller and smaller as

approaching the center of said panel.

21. A large-sized liquid crystal display as claimed in Claim 20, wherein as said liquid crystal arranged in said liquid crystal display element is used guest-host type liquid crystal.

22. A large-sized liquid crystal display formed by arranging a large number of liquid crystal display elements on a single plane, each of said liquid crystal display elements being formed by arranging liquid crystal between transparent substrates which allow light from a light source to pass through, characterized in that a plurality of light guides are provided such that one or more light guides are provided for one of said liquid crystal display elements to guide light rays, in that said light guide has a shape so that its area of its one side is larger than the area of the other side which is connected to said liquid crystal display elements, and in that display portions of said respective liquid crystal display elements are covered by said light guides and junctions between said liquid crystal display elements are also covered by said light guides.

23. A large-sized liquid crystal display as claimed in

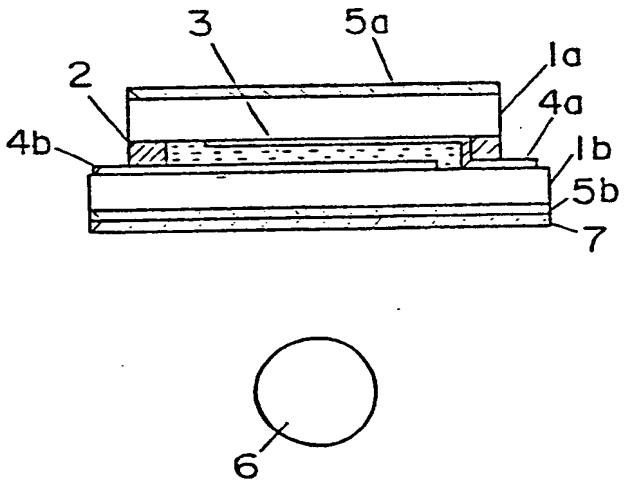
Claim 22, wherein said light guide comprises light guide elements whose number is equal to that of pixels of said liquid crystal display elements.

24. A large-sized liquid crystal display as claimed in Claim 22, wherein as said liquid crystal arranged in said liquid crystal display element is used guest-host type liquid crystal.

25. A large-sized liquid crystal display formed by arranging a large number of liquid crystal display elements on a single plane, each of said liquid crystal display elements being formed by arranging liquid crystal between transparent substrates which allow light from a light source to pass through, characterized in that a plurality of light guides are provided to guide light rays, each of said light guides being formed such that a mirror surface is formed by alumunum vapor depositing on an inner surface of a cylindridal resin molding, the number of said light guides being equal to that of the pixels of said liquid crystal display elements, in that said light guide has a shape so that its area of its one side is larger than the area of the other side which is connected to said liquid crystal display elements, in that display portions of said respective liquid crystal display elements are covered

by said light guides and junctions between said liquid crystal display elements are also covered by said light guides, and in that said light guide elements are provided with inclination with respect to a plane of glass plates forming said liquid crystal elements such that the inclination angle of said light guide elements is maximum at the periphery of the panel and becomes smaller and smaller as approaching the center of said panel.

FIG.1



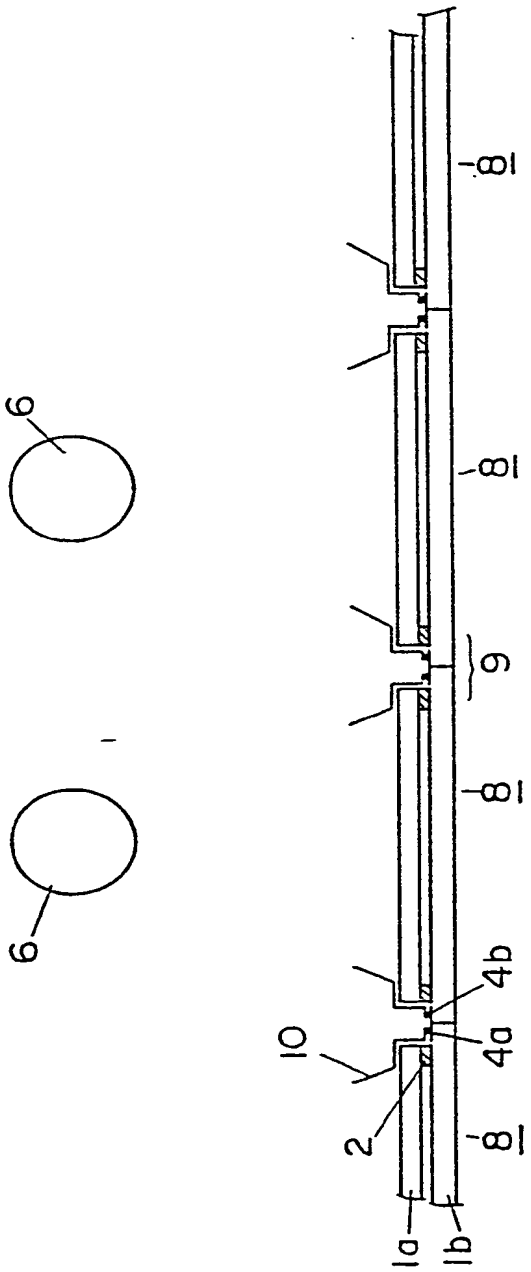


FIG.2

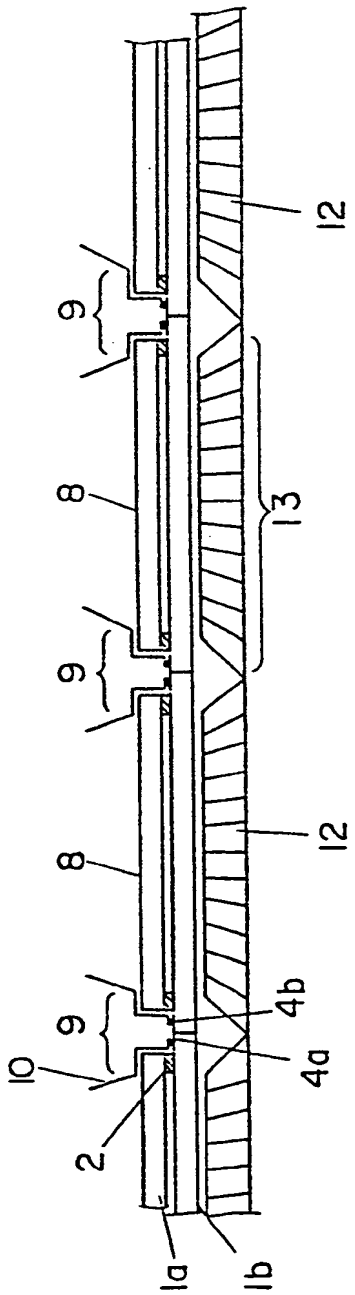


FIG.3

FIG.4

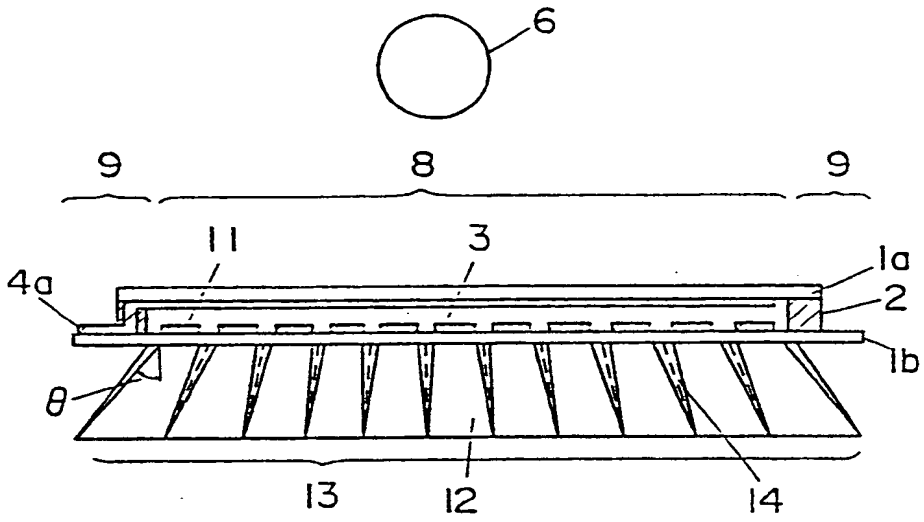


FIG.5

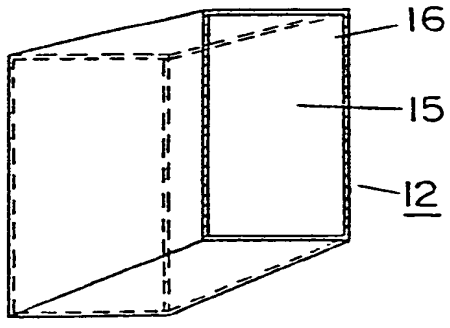


FIG. 6

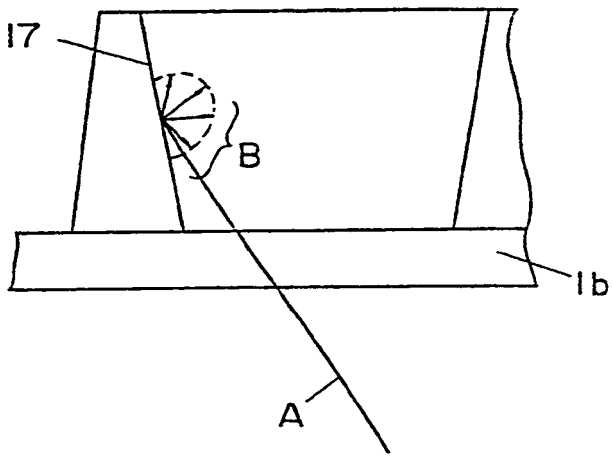


FIG. 7

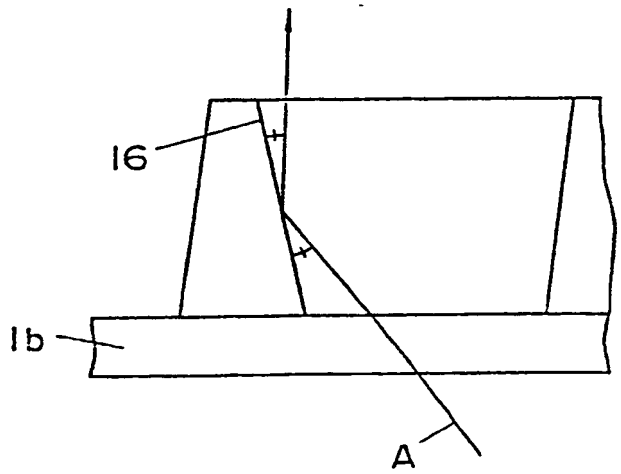


FIG.8

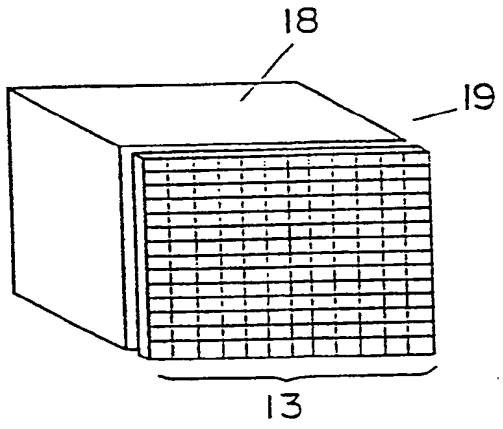


FIG.9

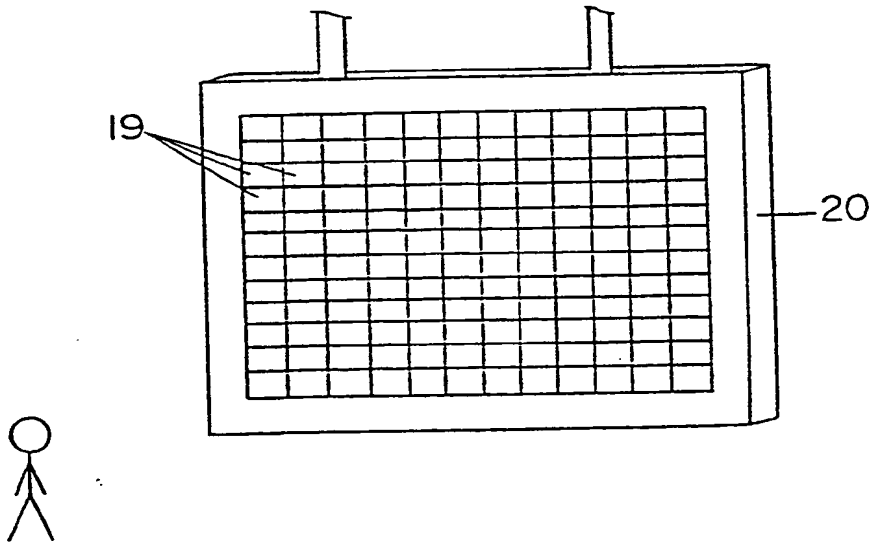


FIG. 10

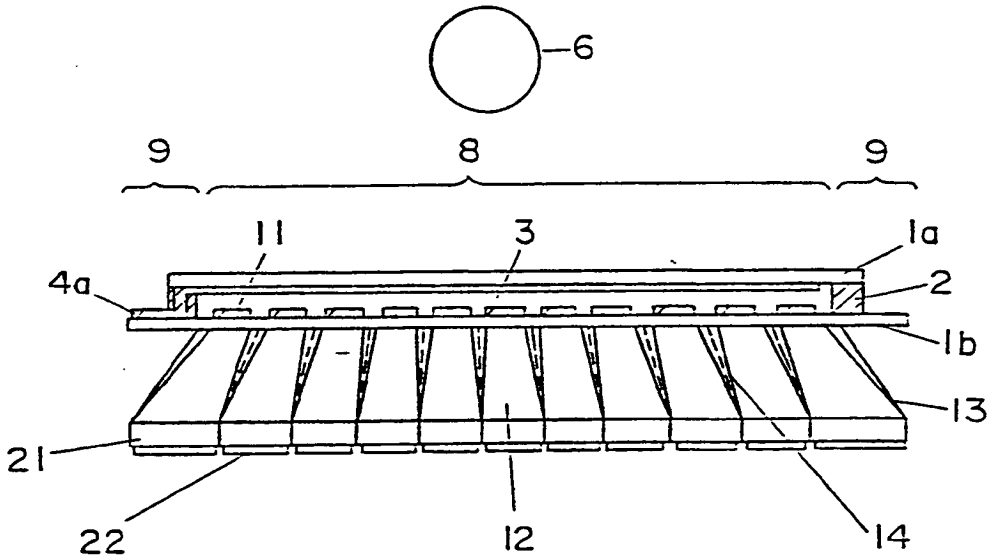


FIG.11

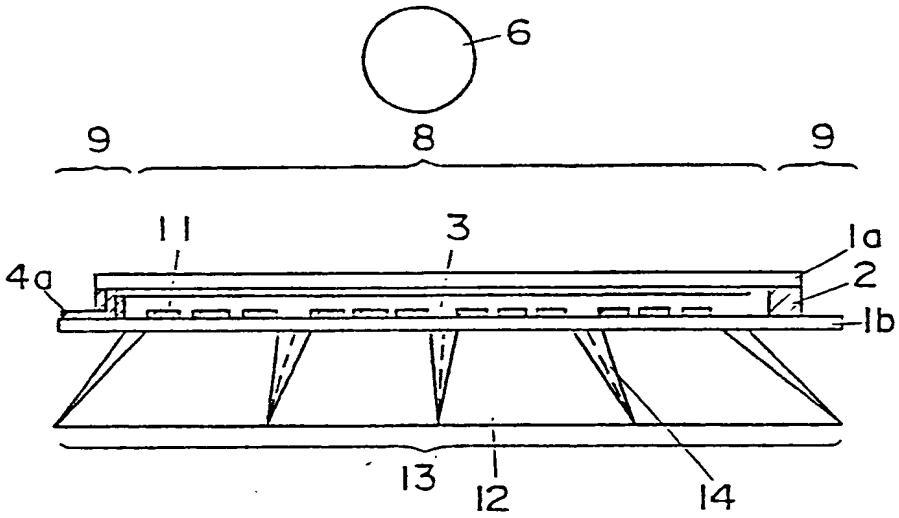


FIG.12

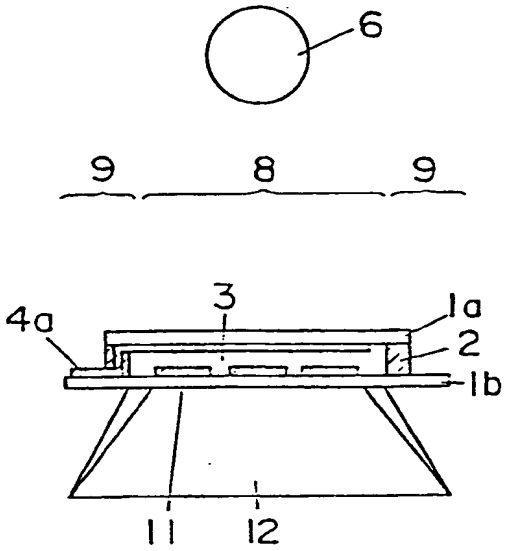


TABLE OF REFERENCES IN THE DRAWINGS

1a, 1b ... glass plates

2 ..... sealing resin

3 ..... liquid crystal

4a, 4b ... electrode leader portions

5a, 5b ... polarizing plates

6 ..... light source

7 ..... diffusion plate

8 ..... liquid crystal display elements

9 ..... junctions

10 ..... lead wires

11 ..... pixels

12 ..... light guide elements

13 ..... light guide

14 ..... adhering portion

15 ..... solid body

16 ..... mirror surface

17 ..... diffusion reflection surface

18, 20 ... frames

19 ..... liquid crystal display unit

21 ..... diffusion plate

22 ..... color filters

INTERNATIONAL SEARCH REPORT

International Application No. PCT/JP85/00149 0179913

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl[4] G09F 9/35

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC	G09F 9/30, 9/35, 9/40

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

Jitsuyo Shinan Koho 1964 - 1984
Kokai Jitsuyo Shinan Koho 1972 - 1984

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category*	Citation of Document, [15] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
P	JP, A, 59-123871 (Epson Kabushiki Kaisha) 17 July 1984 (17. 07. 84) (Family : none)	1
P	JP, A, 59-105677 (Mitsubishi Electric Corp.) 19 June 1984 (19. 06. 84) (Family : none)	1 - 19
P	JP, A, 59-210477 (Epson Kabushiki Kaisha) 29 November 1984 (29. 11. 84) (Family : none)	1 - 25
Y	JP, A, 59-22089 (Mitsubishi Electric Corp.) 4 February 1984 (04. 02. 84) (Family : none)	1 - 25
Y	JP, A, 58-184988 (Jean Polar) 28 October 1983 (28. 10. 83) & FR, A, 2524745	1 - 25
Y	JP, B1, 37-281 (Hitachi, Ltd.) 25 January 1962 (25. 01. 62) (Family : none)	1 - 25
Y	JP, B1, 40-20752 (American Optical Co.) 15 September 1965 (15. 09. 65) (Family : none)	
Y	JP, Y1, 43-19737 (Matsushita Electric Industrial Co., Ltd.) 17 August 1968 (17. 08. 68) (Family : none)	3 - 25

* Special categories of cited documents: [16]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
May 28, 1985 (28. 05. 85)	June 3, 1985 (03. 06. 85)
International Searching Authority [1]	**Signature of Authorized Officer [20]**
Japanese Patent Office	

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